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Montana's Advanced Driver Education Program

A Training Manual for School Bus Drivers

Montana Office of Public Instruction
Division of Pupil Transportation Safety
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Acknowledgement

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Terry Brown, Specialist
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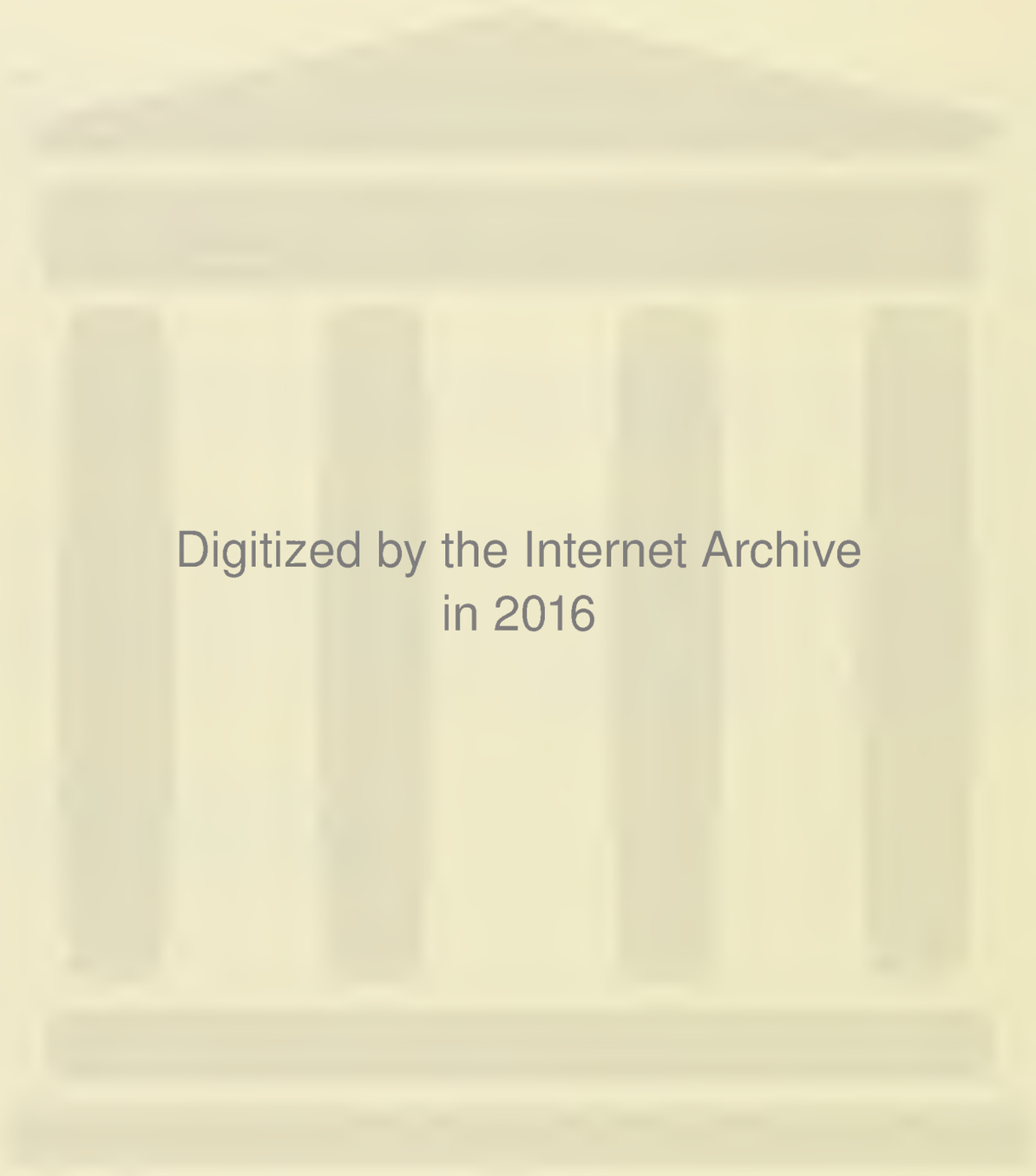
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Foreword

The Montana Office of Public Instruction has been involved with bus driver training for many years. One of our major objectives has been to provide the finest statewide pupil transportation safety programs possible. Experience has shown that even the most competent and careful driver may eventually have to face an emergency situation on the road where correct judgment and quick response prevent a collision.

Unfortunately, few drivers have had a chance to practice the techniques required to handle these critical emergency situations. The purpose of this Advanced Driver Education Program is to provide drivers with this type of practice. Through a series of planned exercises and experiences we teach drivers to respond quickly and correctly to a variety of common driving emergencies.

The program described in this manual is designed for presentation to school bus drivers. However, the techniques described herein should be taught only by a person who has completed the Montana Advanced Driver Education Program or its equivalent.

Ed Argenbright
Superintendent of Public Instruction

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Prerequisites to School Bus Advanced Driver Training

The course described in this manual is designed to help avoid school bus accidents through the development of advanced driving skills. We recommend that a driver meet the following minimum physical, knowledge and driving skill requirements:

MINIMUM PHYSICAL REQUIREMENTS

A. Pass complete physical examination every three years.
B. Pass complete visual acuity test.

MINIMUM KNOWLEDGE REQUIREMENTS

A. Knowledge of the rules of the road pertaining to school buses.
B. Total knowledge of the instruments and operating devices on Montana school buses.
C. Procedure for loading and unloading the school bus and getting students safely across the roadway.
D. Basic school bus operation.

MINIMUM DRIVING SKILL REQUIREMENTS (ACTUAL DRIVING EXPERIENCE)

A. Mastery of stopping and starting procedures.
B. Proficiency in shifting gears on a standard and/or automatic transmission at proper speeds, including how to downshift effectively.
C. Proficiency in using outside and rearview mirrors.
D. Skills in stopping and starting a school bus at intersections, railroad crossings, hills and inclines.
E. Ability to make right and left hand turns in all combinations of lanes at intersections.
F. Skill in backing a school bus into a parking space.
G. Skill in turning a school bus around in the width of the highway or by utilizing driveways.
H. Skill in entering and leaving an expressway.
I. Highway and expressway driving experience at highway and expressway speeds.
J. Ability to pass another vehicle safely with a school bus.

Individuals who do not possess the basic knowledge and skills described above will experience difficulty in successfully completing the school bus driver training program contained in this manual. These minimum requirements should be considered prerequisites for this specialized course.

Protection of the School Bus Passenger as a Pedestrian

PROBLEM

School bus accidents are few in number, and buses have one of the lowest accident rates per mile driven. However, the very nature of the cargo makes these accidents a major concern of every parent, citizen, school administrator and public official throughout the nation. Upon examining the school bus accidents that do occur, it is found that injuries and deaths occur far too often when a youngster is a pedestrian crossing a highway before entering or after leaving a school bus. Let's examine the problem and see what action can be taken to minimize its occurrence.

The measures a school bus driver takes to protect school children when getting on or off the bus are of major importance. Children must be safeguarded from traffic and from the school bus itself. It is essential that students know and understand the correct procedure to follow, and the school bus driver must see that the rules are adhered to.

The somewhat confusing regulations pertaining to school bus operation are themselves a part of the problem. There is a lack of uniformity between school districts and between states. The state and local regulations vary from the recommended procedures of NHSTA Safety Standard 17 (Appendix 2). Because of these variations, the school bus driver may be confronted with other drivers who are not familiar with local school bus regulations. This makes protection of the students more difficult.

SOLUTIONS

Upon reviewing the problem, we would suggest that the following courses of action be considered as a means of minimizing conflicts between buses or other traffic and students.

Every school bus driver can help protect his passengers as pedestrians by making sure they adhere strictly to the established rules for entering and leaving a school bus.

By making it a practice to watch every youngster as he crosses the street on his way to or from the bus, the driver can be sure that the children in his care are safely located before putting the bus into motion.

The local school bus supervisor should plan his routes so that loading zones are located in easily accessible areas, with maximum visibility from all directions. Never should a loading zone be located on a hill, curve, dip, or in an area hidden by buildings, trees or other obstacles. If this type of clear, open loading zone cannot be found, then the school should take the necessary steps to have the highway department erect warning signs. These should be placed at least 500 feet from the loading area in each direction.

School administrators should see that their school bus drivers are totally familiar with the procedure for protecting school children when they are approaching and leaving the bus. They should also see that all rules and regulations are adhered to.

Local school districts should provide a school bus educational program for the students at the beginning of each year and at least one more time during the year. This program should explain procedures for entering and leaving the school bus and crossing the highway, as well as emergency evacuation procedures.

Parents of school children should also be familiar with the procedures and regulations concerning crossing the highway to and from a school bus loading zone. This can be easily accomplished by sending each parent a copy of the rules and regulations before the school year starts. Parents can reinforce the proper procedures in crossing a highway if they are familiar with the school system's regulations and requirements.

Local communities should revise their regulations and school bus policy to conform with Office of Public Instruction regulations, the National Highway Traffic Safety Administration's School Bus Standard No. 17 and the nationally recommended Uniform Vehicle Code. Periodic public announcements should be made to the motoring public, informing drivers of the proper procedures when meeting a school bus that is loading or unloading passengers.

The above are just a few suggestions. All possible steps should be taken to protect school children when going to or from the school bus.

School Bus Operation—Maintenance

A study of school bus accident reports from around the country shows that mechanical problems are an important factor in the initiation of collisions. Inadequate maintenance is primarily responsible for mechanical failures.

The solution is a conscientious school bus inspection and preventive maintenance program. More than just a daily pre-trip inspection by the driver, it should include regularly programed maintenance and detailed inspections performed by a mechanic. Also, a system for handling repairs of unscheduled problems is needed. An important key in making the maintenance program successful is a communication system that keeps everyone who is involved informed.

The response of the school bus operator to equipment failure may be as important as the failure itself. First, it must be recognized that a problem exists, and then the problem must be specifically identified. Finally, the driver must possess the knowledge and the skill to handle the situation so as to minimize any conflict that may arise.

MAINTENANCE-RELATED MECHANICAL FAILURES

Tires

All the controls that a driver has at his disposal—steering, throttle, brakes—depend on the tires to put the bus into action. In other words, the tires are the final link in making the vehicle do what the driver wants it to do. This is accomplished through three types of traction: **Driving, braking** and **cornering**. Driving traction pushes the vehicle forward, and braking traction works in the opposite direction to stop it. Both these forces act in the direction that the tire is rolling. Cornering traction is different. It works on the side of the tire perpendicular to the direction in which it is rolling. This is what keeps the vehicle moving in the desired direction in any type of turning maneuver.

Under dry road conditions, braking and acceleration reduce cornering traction. The greater the braking or acceleration, the greater the loss of cornering ability (see Figure 1). Tires cannot corner when the wheels are locked by the brakes, causing the tires to slide, or when the tires are spinning because of too much throttle. (The latter is not likely to happen with a bus on dry pavement.) This means that if you try to steer and at the same time have the brakes on so hard that the tires are sliding, the bus will not respond to the steering but will continue to slide straight ahead. If you attempt to maneuver on a slick road with the rear wheels spinning, the front wheels will corner, but the rear wheels will not, causing the rear of the bus to slide out.

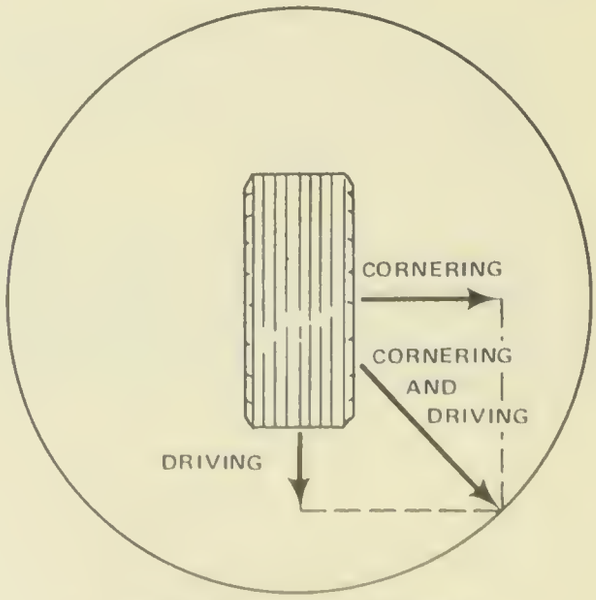


Figure 1 – Sum of Forces

Maximum tire performance begins with proper maintenance. Tread depth and inflation pressure greatly affect the ability of the tire to do its best job.

Tread depth is important because it affects the maintenance of tire traction on wet pavement, snow, slush, or mud. It is easy to understand how deep tire tread helps in snow and mud, because the tire can ''bite'' through to the surface rather than just spin on top.

Under rain conditions, the way a tire's tread works to maintain traction is not so easily understood. The grooves in the tread allow the water covering the road to escape from beneath the tire, letting the ribs of the tire contact the pavement and provide traction. Deeper tread means more water can be dissipated from under the tire. Therefore, as a tire wears, it is losing more and more ability to get rid of water. It finally reaches the point, even though there is some tread remaining, where the tire has no more traction on a wet road than if it had no tread at all. The tire should be replaced before it reaches this condition. Each state has its own specifications on the allowable tread wear permitted before replacement is required.

For each vehicle there is a correct pressure(s) at which the tires should be maintained. A tire can have too much as well as too little pressure. Incorrect pressures usually occur because of neglect or lack of information as to what they should be. A routine for checking tire pressures needs to be carried out.

An under-inflated tire does not have as much load carrying capacity as one that has the correct pressure. This condition could cause the tire to overheat and possibly fail as a result. Under-inflation can also alter the handling characteristics of the bus and fuel consumption.

The extreme case of tire failure is a blowout. It is almost always an unexpected occurrence. The sound the tire makes is unlikely to be heard above the passenger and bus noise. The first indication of the problem is usually the reaction of the bus to the flat tire.

When a front tire blows out, there is a delay before the driver feels the effect on the steering. The effect is an increased drag on the side of the blowout. The bus will be pulled in that direction.

When a front blowout is experienced, the proper reaction is to ease off the throttle and steer as necessary to keep the bus in its lane. With the bus under control, gently apply the brake and pull off the road in a safe area. With care, it is possible to drive slowly on a flat tire for some distance in order to reach an area where the bus can be safely parked.

A blowout on a rear dual is not nearly as serious, obviously, because there are two tires to support the bus. Therefore, the bus can still be driven. Several factors must be taken into consideration, however, since the remaining tire is now carrying twice the load. It may be overloaded and thus is more susceptible to failure. One tire is also doing the job of two in providing traction. Lack of traction may especially be noticed in cornering. Driving with a flat dual will cause heat to build up in the flat tire. At sustained highway speeds, it is possible for it to catch on fire. Because it is carrying an additional load, heat also builds up in the good tire, increasing its possibility of failure.

All of the above conditions involving a rear blowout can be relieved by simply slowing down. Special care should be taken to preserve the remaining tire. By driving slowly and with due care, short routes can be completed.

Brakes

There are two types of braking systems used—hydraulic-vacuum boost and air brakes. Both systems need to be inspected and adjusted as part of the regular bus maintenance schedule. Both are dual systems, meaning that if half of the brakes fail, the other half will continue to function. When half of the system has failed, the braking effort on the part of the driver is increased.

Air brakes are more sensitive than hydraulic brakes, and it is necessary to become familiar with the ''feel'' of them before on-the-road operation begins. During the pre-trip inspection, the air compressor belts in the engine compartment should be checked. The air pressure gauge on the instrument panel should also be checked to be sure there is enough air pressure. (Check the vacuum guage on buses that have hydraulic-vacuum boost brakes.)

An air brake system has a primary and a secondary air supply. The secondary air supply will operate the service brakes if for any reason there is a loss of the primary air supply. (A warning device will indicate to the driver when the air pressure in the primary tank drops below a certain level.) However, the number of brake applications that can be made using this backup system is limited. Therefore, when the primary air supply is lost, the bus should be safely parked as soon as possible. When the secondary air supply is exhausted, the emergency brake is automatically applied, making the bus immobile. The emegency brake will remain engaged until the air supply is restored in the secondary reservoir or the brake is mechanically released.

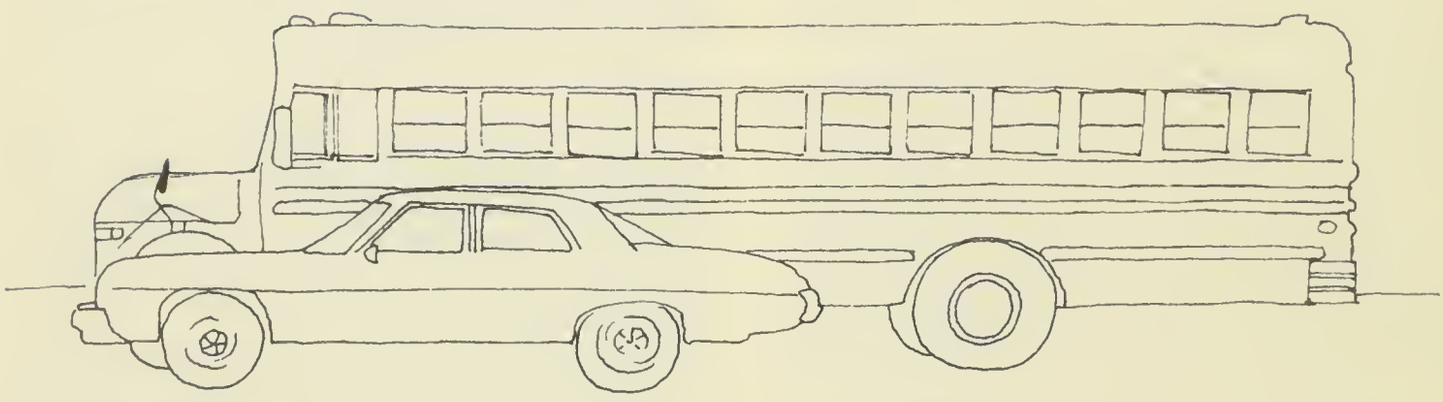


Figure 2—Size Comparison

The air tanks, hoses, and fittings need to be checked regularly for conditions that may produce a leak. The air pumped into the supply tank contains moisture. It condenses inside the tank and can cause maintenance problems with the internal parts of the air brake system unless it is removed. The air tank should be bled on a regular basis.

Drive Train

All parts of the drive train—engine, transmission and clutch, drive shaft, differential and axles—need to be maintained on a regularly scheduled basis. An engine in tune is particularly important to smooth, safe operation of the bus.

Careful inspection of all belts in the engine compartment will do much to prevent overheated engines, dead batteries and loss of air brake pressure.

A check of fluid levels is important too. A battery goes dead with too little electrolite; engines overheat when the coolant is low or when it is frozen and can't circulate; and, an engine can seize when there is insufficient crankcase oil. In sloppy weather also make sure there is plenty of washer fluid to keep the windshield free of road spray.

Steering and Suspension

Steering and suspension components should be included in the regular bus inspection and maintenance schedule. Abnormal tire wear can indicate misalignment. A sagging body might suggest a broken spring, and worn shocks can cause excessive body motion. While these conditions might not be on the inspection checklist, the driver can be a very important communicator to garage personnel of problems in these areas. All it takes is familiarity with the bus and knowledge of requirements for normal performance.

Power steering loss is readily apparent to the driver. However, steering is still possible, with increased effort.

School buses undergo constant and rugged usage. Problems may arise. Drivers need to be fully aware of the vehicle so they can detect any malfunction when it occurs. A system of communication is needed so that information regarding repairs can be passed on to maintenance personnel. The best efforts of everyone involved with the bus program are necessary to insure that all vehicles are kept in service in the best possible condition.

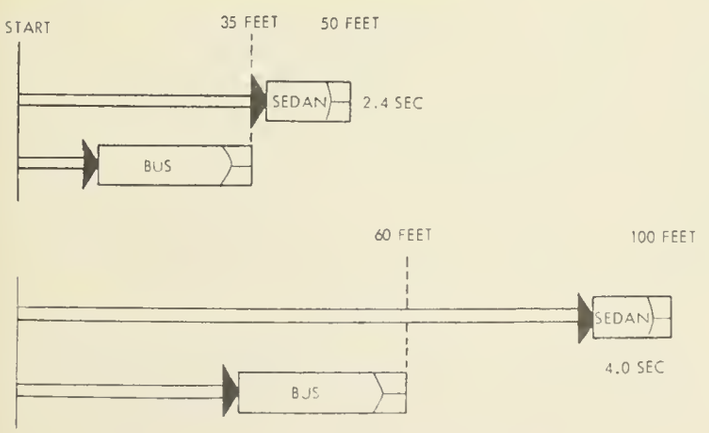


Figure 3—Acceleration Comparison

Proper Negotiation of Intersections

The Problem

The school bus driver must negotiate many intersections in the course of his daily route. These can vary from a complex intersection of two four-lane highways to the intersection of the school driveway with the main road. In fact, anywhere two roads meet is an intersection. These are the most dangerous places on a school bus route. Statistics show that nearly half of all school bus accidents occur at intersections. The negotiation of intersections can be made safer through a better understanding of the size and performance of the bus and through the development of better visual habits for the driver.

Size and Performance Concepts

It is natural for the new school bus driver to be more accustomed to the size and performance of his automobile than his bus. This can also be a problem with the more experienced driver. Regardless, it is important to understand the differences when negotiating an intersection.

A 66 passenger school bus is twice as long as an average full size sedan, but it has three times as much distance behind the driver (Figure 2).

It is a simple fact that it takes the longer vehicle more time to pass through an intersection. This problem is further complicated by the location of the driver's seat in relation to the length of the bus. When the driver's position in the bus has physically cleared the intersection, the driver may mentally relax. However, much of the bus body is still exposed to possible danger. Alertness to the situation is necessary to prevent problems from occurring.

Acceleration capability is much less with a school bus than with a car. A fully loaded 66 passenger school bus can weigh up to 24,000 pounds. A full size sedan carrying only the driver weighs only 4,500 pounds (Figure 3).

Vehicle size, acceleration capability, and load all affect the time required for a bus to negotiate an intersection. It boils down to the fact that it takes more time for a school bus to go through an intersection than it does for a car. Therefore, a much larger opening in traffic is required for a school bus than for an automobile.

In order to be better aware of how much time it takes schol buses to clear intersections, actual times of buses in surrounding school districts have been recorded. The results are given in Appendix 3.

The base figures in Appendix 3 show that, under controlled conditions, a school bus can be driven through an intersection in less time than occurs in actual practice. These figures also show that a bus can take up to twice as long to clear an intersection as a car. The school bus driver must adjust to the size, load, and acceleration capabilities of the bus, and he must travel through the intersection with more deliberation than when he's driving his personal car.

VISUAL PERCEPTION CONCEPTS

Authorities today agree that safe highway driving is fourfold: the driver identifies, predicts, decides and executes. The first two of these, identify and predict, have direct application to performance of school bus drivers at intersections. By equipping drivers with the visual perception skills necessary for the identification and prediction of clues in the highway environment, driving performance can be improved. In any traffic situation, and especially an intersection, the vehicle directly ahead should be only one of the clues taken into account. Sufficient following distance must be maintained so that activity around a vehicle can be observed. Also, the school bus driver must scan traffic far enough ahead to be aware of potentially dangerous situations that may develop. Measurements, such as the length of the bus, the distance between telephone poles, or even a certain specific number of feet, have been advocated for determining scan and following distance. A much more accurate way to determine these distances is through the use of a measured time span (Figure 4).

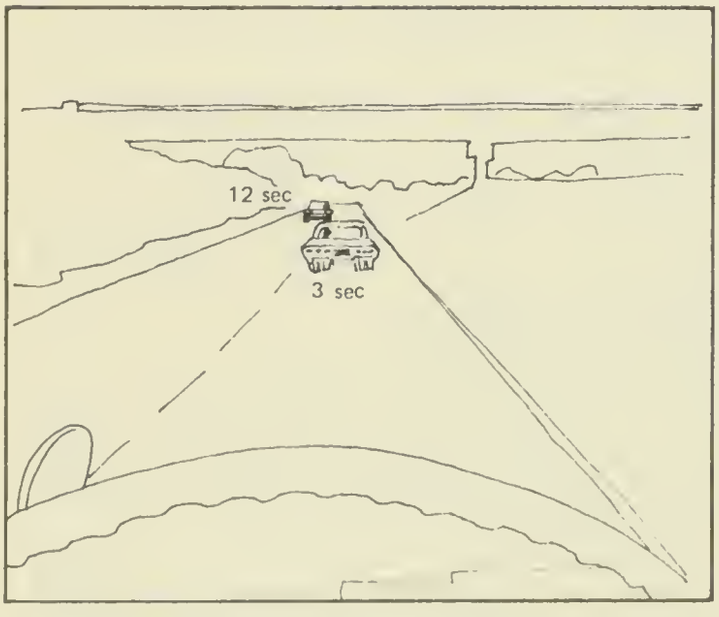


Figure 4—Three-Second Following and Twelve-Second Forward Scan Distances

FOLLOWING INTERVAL

The Three-Second interval is a method used to gauge following distance. To understand this timed technique of maintaining a safe following distance, think of your bus following another vehicle. As the vehicle ahead passes a fixed road mark, (sign poles, a mail box, or shadow) start counting A thousand one, A thousand two, A thousand three. By the time you complete your Three Second count, the front of the bus should be just passing by the fixed point. If you take less than Three Seconds to reach the checkpoint, you are following too closely to the vehicle ahead. This Three-Second rule for following distance automatically adjusts to any speed. If conditions are bad (fog, rain, poor road conditions), add an extra second or two to the regular Three-Second rule for following distance. By making this Three-Second rule for following distance a part of your driving, you are assuring yourself of time and space to safely see, react, and execute a driving maneuver safely. Concentrate on making this technique a habit, and you soon will be establishing a safe following distance automatically.

FORWARD SCAN DISTANCE

After you have learned to use the Three-Second Principle, you are ready to start working on one of the best visual habits you can develop. Again, pick a fixed point down the road at about the distance you normally concentrate your attention. Pick a point, such as the crest of a hill, a bridge, or bend in the road. By doing this, you can count the time that elapses before you pass that point. Count off the seconds: A-thousand-one, A-thousand-two, etc., that it takes you to travel to the fixed reference point. It should be Twelve Seconds.[1]

You may find that your average point will be from six to eight seconds away. This is the case for the average untrained individual. It takes experience to learn to look Twelve Seconds ahead. Push yourself and you will find that you can exceed this Twelve-Second goal. Again, the Twelve Second rule adjusts to all speeds just as the Three-Second rule does. Obviously, one cannot see Twelve Seconds ahead around a corner, under a bridge, into fog, or in some stop-and-go city driving. There may be other exceptions to the Twelve-Second concept, but think of it as an optimum goal. In both cases of following time and visual lead time, three and twelve seconds may not be exactly right for you. They are good places to start, however, until you can determine what is exactly right for you. The idea is to make two, three, or four seconds of following distance and ten, twelve, or fourteen seconds of visual lead time a HABIT, so that you will be in a position to avoid most traffic conflicts.

It is also important to correct the position of your vehicle within the traffic pattern. Common sense tells you that you can accelerate, brake and steer to adjust your position. Once you have developed the habit of looking ahead through the use of the Three and Twelve-Second time rules, you will not only see "traps", but will also have more time to adjust lane position, speed, and following distance. This eliminates many of those panic reaction situations by keeping aware of what is happening ahead.

1 "How To Drive." American Automobile Association Washington, D.C.

SKILL DEVELOPMENT

Another aid to visual perception is the technique of classification of traffic events. This technique aids the driver in processing all the varied information from the traffic scene. A description of the classification system is appropriate. There are four divisions of events in the traffic scene: traffic controls, other traffic, highway features, and events inside the vehicle. Traffic controls include all types of signs and roadway markings as well as physical features,such as unmarked intersections. Any other animal, vehicle or pedestrian on or near the roadway makes up the ''other traffic'' classification. Highway features include the various types of physical roadway features, such as type of pavement, surface, roadway structure (lanes, curves, shapes, etc.), type of intersection and atmospheric conditions. Events inside the vehicle include passengers, control panel indicators, vehicle vibrations and sounds, and glare.[2]

Training in this classification technique has been shown effective and can easily be adapted to a local level. A series of slides containing from one to five ''traffic events'' should be used in a progressive manner. That is, fewer events should be used until skill is developed. Each slide should be shown approximately three seconds. This forces the class to identify and respond quickly. Also, training sessions of from 10-15 minutes are more effective than lengthy sessions. Below is an example of a classified traffic scene (Figure 5).

The traffic scene should be scanned, looking for one category and then another: i.e., when looking over the traffic scene, the bus driver should look for all the traffic controls, then for the other traffic, then for the roadway features and, finally, for things inside the vehicle which might be important to driving in that situation. If the names of the classifications cause confusion, they can be changed. They are merely suggested names that have worked in the past. If you have better ones, use them. Of more significance is being able to quickly classify and decide the importance of events in the traffic scene.

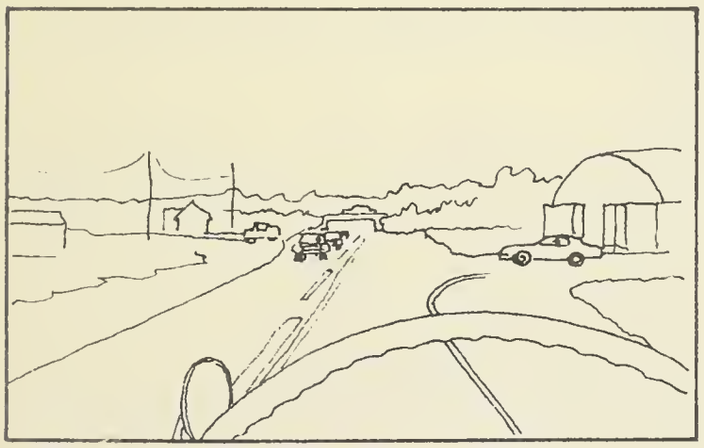


Figure 5

1. **Traffic Controls: No passing.**
2. **Other Traffic: Vehicle at T intersection, approaching traffic, vehicles at cross intersection.**
3. **Highway Features: Straight, clear and dry surfaces, stop intersection.**
4. **Events Inside the Vehicle: None.**

APPLICATION TO INTERSECTIONS

Any technique is only as good as its application. The various visual perception techniques are easily applied to open road driving and are also important in the negotiation of intersections. As you approach an intersection, ask youself if you have scanned well enough in advance to classify the traffic scene. Are any of the classifications changing as the bus gets closer? Are you maintaining a sufficient following time? Is there anything new entering the scene? You, as a school bus driver, must adapt these perception techniques to specific intersections. By doing this, you will be taking a considerable step toward safer driving.

Controlling the School Bus in a Situation Demanding Maneuvering Skills

Accident statistics show that many school bus drivers are not controlling their buses in situations that require skillful maneuvering. There may be many reasons for this, but it is too often because the driver has a panic reaction to the situation. He simply is not aware of the accident avoidance capabilities of the school bus and what can be done in a tight situation. For this very reason, it is extremely important that the school bus driver become fully familiar with the capabilities and limitations of his bus.

CAR-BUS COMPARISONS

A school bus and an automobile handle differently. The sizes, suspensions, tires, and load carrying capacities are entirely different. However, since people are generally familiar with their automobile, it is a good place to start for comparison purposes.

Steering Inputs

The response of an automobile to steering inputs is fairly quick. The school bus is much slower responding than the automobile. This is because it is bigger and heavier than a car. The school bus driver should try steering his bus to see how much time it takes to respond, and he should adjust his driving habits accordingly.

Roll Characteristics

Most modern automobiles are designed so that the body does not roll excessively in a turn. Likewise, a school bus is designed to have only small angles of body roll in a turn. Because of the larger size, however, these small angles can produce much more motion of the body. This can be very uncomfortable for the passengers and should be avoided whenever possible.

2. Quane, W. Laurance, **Visual Perception and the Driving Task,''** Driver and Public Safety Education Research Digest, 1971.

Braking Response

The braking response of a school bus also differs from that of an automobile. This also can be attributed largely to size and weight differences. The nose dive caused by braking is kept to a minimum in a bus, but the longer bus body increases the motion of the vehicle. This can cause discomfort for the passengers when the brakes are improperly applied and can even throw them out of their seats. Proper application of the brakes must be practiced, in addition to making the necessary adjustments from car to bus braking.

DRIVER PREPARATION

Seat Adjustment

Seat adjustment is an important factor in the ability to control a bus. You must be comfortable while driving to avoid fatigue and you must allow yourself maximum freedom to maneuver the vehicle with ease.

Position the seat as far back as your leg length will allow and where you will still be able to operate the foot controls. In this position, your thighs should be resting on the seat and the knees should be slightly flexed.

Make sure the seat is locked in position. You should not feel cramped. It's important for steering ease that your arms be extended, moving the elbows away from the body (Figure 6).

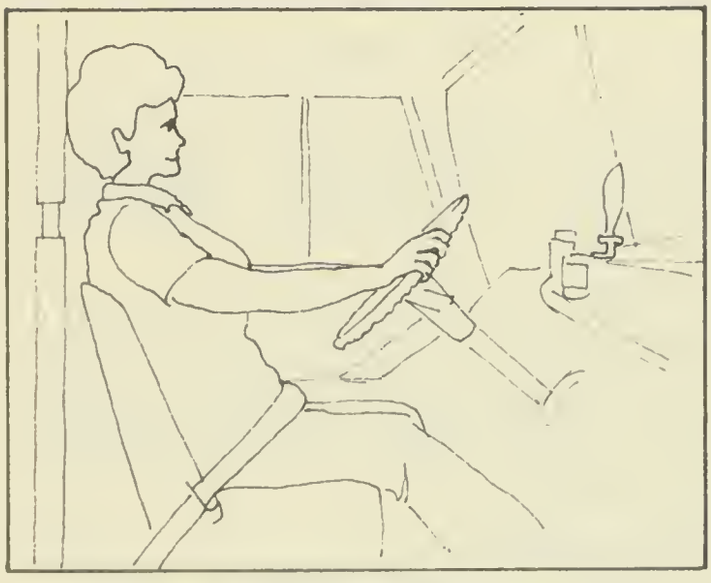


Figure 6—Proper Seating Position

Mirrors

Mirrors offer your only contact with the traffic situation behind you. Their proper adjustment is an important part of good driving position. While sitting in the seat, adjust the inside mirror so that it highlights the rear of the vehicle and you can see several hundred feet behind it. Adjust the outside mirrors from the same seating position so you can see several hundred feet to the rear using the sides of the bus as reference points. Mirrors set in this manner will allow you to see traffic conditions behind you at a glance (Figure 7).

All Montana buses must have convex mirrors which allow the driver to see pedestrian traffic that is very near the front of the bus (Figure 8).

The adjustment should be checked to insure proper visibility for the individual driver. Convex mirrors should not be used for distance or location judgments, but only for determining the existence of a pedestrian or other obstruction in the mirrors' field of view.

Instrument Panel

The last element of good driving preparation is total familiarity with control locations on the instrument panel. You should have a mental picture of where the controls are placed so that you can reach any of them without taking your eyes off the road.

DRIVING EXERCISES

A school bus is large and appears difficult to maneuver. It is important to realize, however, that it is quite possible to do many things with a bus that the driver may not be aware of. The only way to determine what is possible and what is not is through actual driving practice. Several exercises have been designed that will help the driver become familiar with the capabilities of a school bus.

SERPENTINE COURSE

The serpentine course is made up of a straight line of evenly spaced cones. The driver weaves through the course passing on alternate sides of the cones.

Objective

The exercise is designed to develop in the driver a sense of control of the vehicle. The exercise helps the driver time his steering properly and judge the relationship of fixed objects with respect to the vehicle.

Exercise Layout (Figure 9)

A straight line of at least five cones is set up, with the cones 60 feet apart. A full lane of 12 feet should be available on either side of the cone course. One side of the approach lane of the evasive exercise, which is described in the next section, can be used for this maneuver. If desirable, the serpentine exercise can be run in conjunction with the evasive exercise.

Procedure

Explain the maneuver and its objective. Then demonstrate the proper way to negotiate the maneuver, emphasizing proper hand position, throttle control, timing and rhythm. After the driver has assumed the proper position in the seat, with his hands at 9 and 3 on the steering wheel, he will run the exercise as follows:

1. Enter the course at a speed selected by the instructor, usually 10 mph to start.
2. Drive through the course several times until a smooth rhythmic pattern is achieved. Increase speed slightly with each run and pass as close to the cones as possible.
3. Upon reaching the end of the course, turn around and repeat the exercise from the other direction.

The course is repeated at increasing speeds until the driver can no longer maneuver the vehicle through the course successfully.

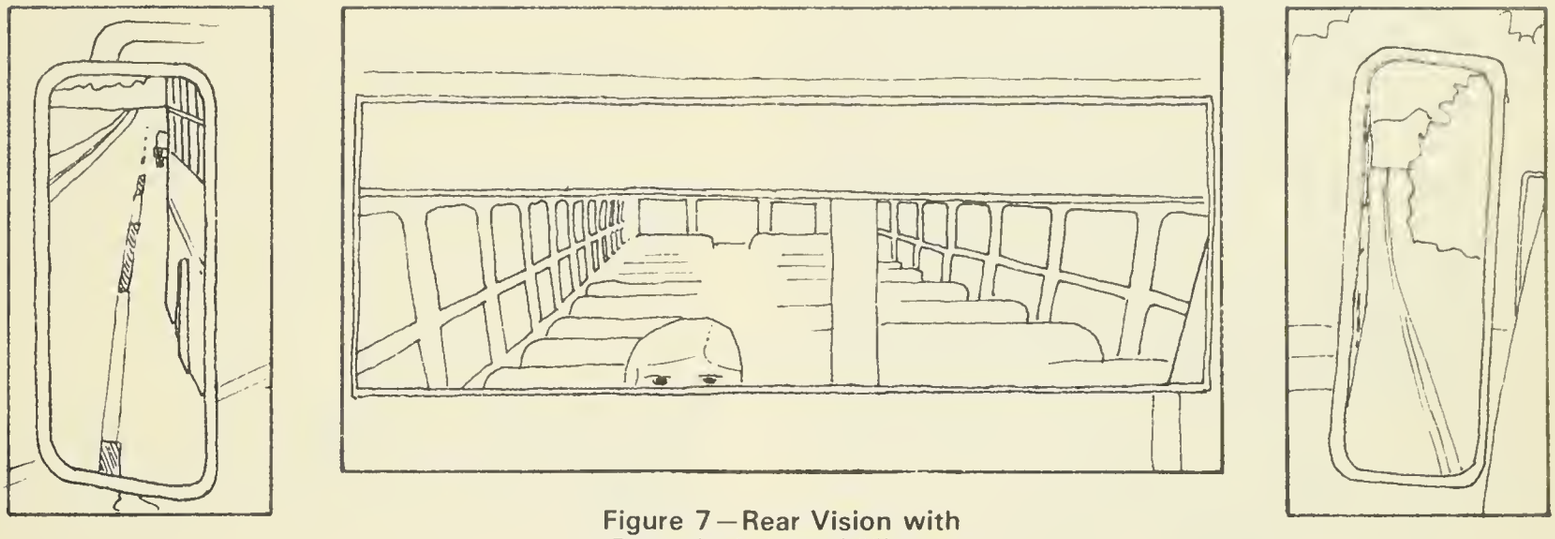


Figure 7—Rear Vision with
Properly Adjusted Mirrors

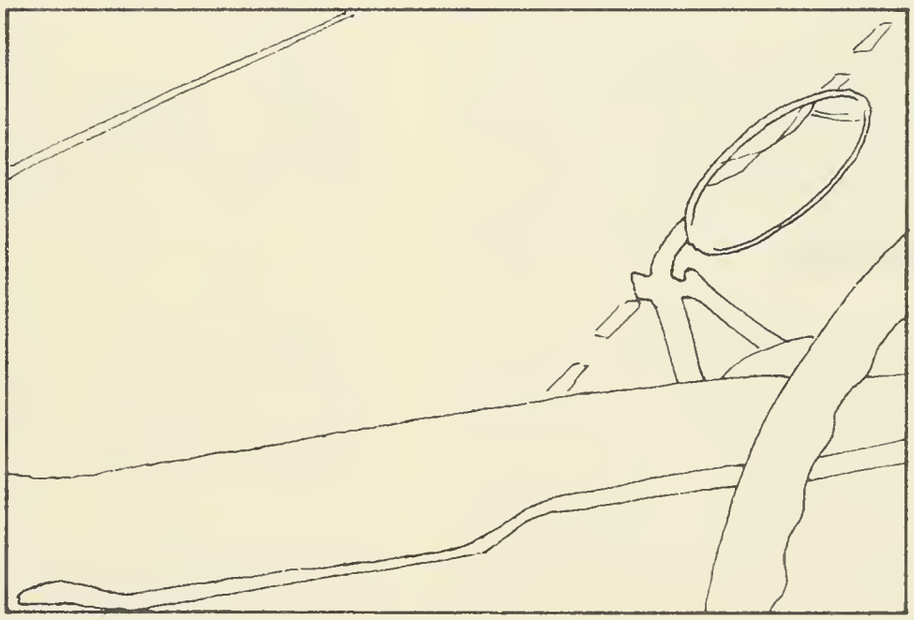


Figure 8—Seven and One-half Inch Convex
Mirror as Seen by the Driver

Figure 9 — Serpentine Course

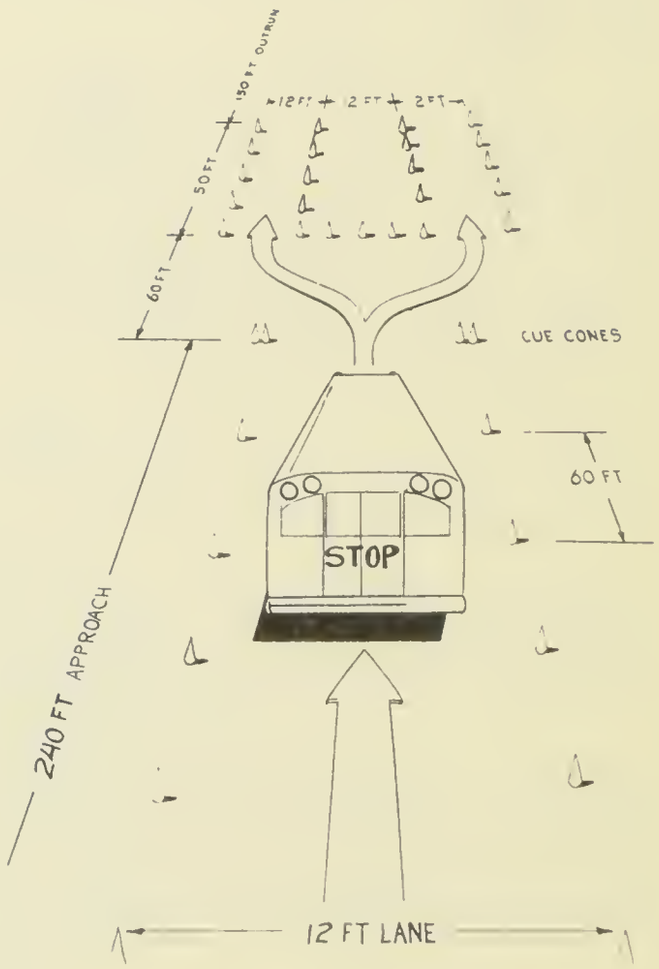


Figure 10 — Evasive Maneuver

Instructor Tips

Explain and demonstrate the exercise so that participating drivers have an idea of the timing necessary to perform the maneuver.

Some of the keys to successful handling of the serpentine maneuver are proper hand position, rhythmic and smooth steering, maintaining steady speed, and proper positioning of the bus at the start. Common errors include the following:

- Premature steering, thus hitting the cone with the front wheel.
- Steering too late, so that the vehicle keeps swinging farther and farther out, preventing negotiation of the last few cones.
- Failure to maintain speed.
- Coming in at too wide an angle on the first cone, which sets the bus up wrong for the remaining cones.
- Letting the bus go by the cone too far, or not far enough before steering.

EVASIVE MANEUVER

The evasive course consists of a blocked 12 foot lane, with 12 foot exit lanes on the right and left of the barrier lane and parallel to it. The driver proceeds down the lane toward the barrier. At a predetermined point, the instructor indicates whether to make a right or left maneuver.

Objective

The objective of the evasive maneuver is to show that the distance required to steer a school bus around an obstacle is often less than the distance needed to brake the bus to a stop. The exercise is also intended to decrease the driver's tendency toward panic braking.

Exercise Layout (Figure 10)

An approach lane 12 feet wide and at least 240 feet long, with cones spaced 60 feet apart, ends at a cone barrier. On both sides of the barrier and parallel to the approach lane are 12 foot exit lanes that extend past the barrier about 50 feet. The distance between the exit lane cones is six feet. The last cone of the approach lane is used as the cue point.

Procedure

Explain the maneuver and its objective. Demonstrate the maneuver so the driver can get an idea of the type of skill he is trying to develop. Assure him that you will coach him through the first run of the maneuver. After the driver has assumed the proper position in the seat, with his hands at 9 and 3 on the steering wheel, he will run the exercise as follows:

1. Accelerate down the approach lane at a speed determined by the instructor, usually 25 mph.
2. At the double cue cones, the driver will attempt to evade the barrier without braking, and with his foot off the accelerator. The direction and initiation of the evasive maneuver will be determined by the instructor, using a verbal command of "Right" or "Left."
3. After evading the barrier, the driver will brake to a stop, turn around, and proceed to the beginning of the course. Speeds are increased with each successful run up to 35 mph.

The maneuver should be repeated with the instructor giving the direction cue at random, until he is satisfied that the driver has acquired the skill to perform an effective evasive maneuver.

Instructor Tips

Demonstrate the exercise so the driver will know what to expect. Important points to remember are: quick and smooth movement of the steering wheel, proper release of the throttle, and no braking. Common errors that are made in the Evasive Maneuver:

- Turns wrong way—usually caused by anticipating the direction to be indicated by the instructor.
- Late steering input and countersteer—wipes out course.
- Does not release throttle.
- Does not have smooth hand movements—fights the steering wheel.
- Panic application of brakes.
- Over response in steering, causing the vehicle to hit both sides of the cone lane.
- Goes in wrong direction and then tries to recover. Once the driver has turned the vehicle in one direction, he should continue in that direction. He cannot recover in time to make any corrections.

SKID CONTROL

A skid is a condition in which the bus has exceeded one or more tire-to-road traction limits. There are three basic kinds of skids.

1. Braking skid: A skid where steering control of the vehicle is lost because the wheels have been locked. Generally occurs with all wheels locked, but could involve locking any one or any combination of wheels.
2. Cornering skid: This occurs when a driver attempts to negotiate a curve at a speed faster than allowed by tire-to-road traction limits, and the bus plows ahead, or the rear spins.
3. Power skid: If the accelerator is applied excessively on a curve, the wheels will spin so that the rear of the bus slides out of control. This is the type most commonly referred to by the average driver as a "skid."

This skid exercise will produce the effect of a power skid by a momentary rear-wheel lockup, rather than spinning the wheels—since cornering forces cannot be produced by the tire when it is locked or spinning. It is important to understand that in your driving a skid can occur because of overapplication of the throttle. Therefore, not only is steering correction necessary to correct this skid, but it is essential to let up on the throttle in order to stop the tires from spinning so they regain cornering ability.

Slippery road conditions are conducive to producing skids. Ice and snow make very slippery surfaces. However, water, mud, leaves, or any loose material can cause a skid on a hard-surface road. Gravel or dirt roads are susceptible to skids under all conditions.

The best skid control is prevention. By judging weather conditions and knowing where skids are likely, such as curves or bridges, many skids can be avoided.

Objective

The exercise is designed to instruct the driver in the proper techniques to control skids. The exercise will also help the driver develop a feel for the behavior of the bus on a slippery road.

Exercise Layout (Figure 11)

The skid pad should be at least 50 feet wide and 300 feet long. The surface should be prepared by coating the road surface with a blacktop sealer to mask the fine-scale texture of the road surface. The sealer should be applied as smoothly as possible. The pad area should have an approach lane of at least 50 feet and an exit lane of 150 feet. This enables the instructor to run skids from both directions. Curves can be set up on the skid pad by using cones.

A water source is necessary to provide a slippery coating on the skid surface at all times. This can be accomplished by using a water truck or a sprinkler system. The sprinkler system could either be built flush to the ground, or set a safe distance from the pad area so that vehicles cannot run over the sprinkler heads. A clear buffer zone of at least 24 feet is needed on either side of the skid pad.

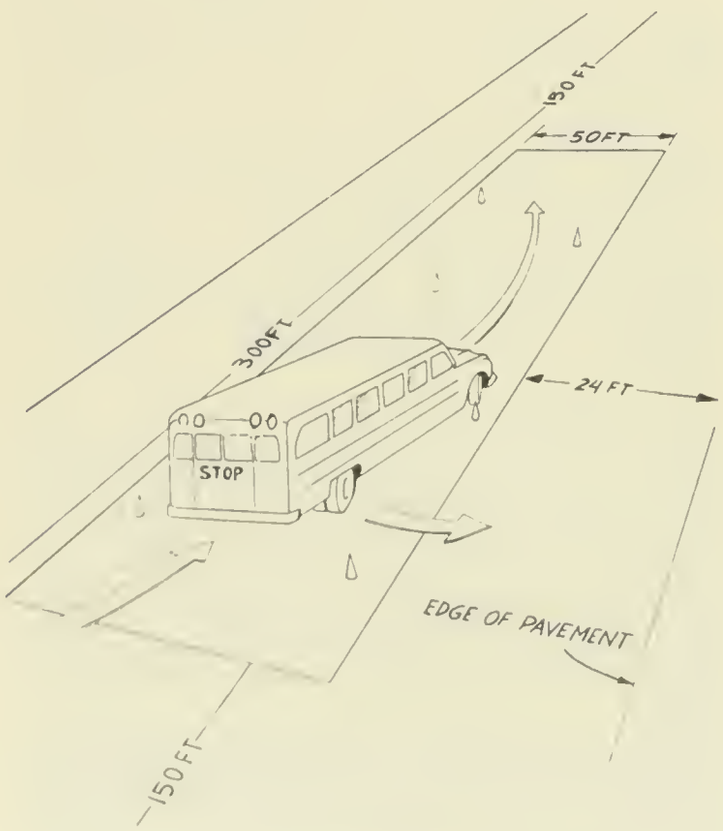


Figure 11—Skid Control Maneuver

Skid Vehicle

The vehicle used for skid exercise can be a standard-size bus equipped with standard tires. The skids may be initiated in one of three ways:

1. By overapplying the throttle and causing the rear wheels to spin.
2. By using the emergency brake.
3. By using a skid simulator.

Procedure

Make sure the driver fully understands the corrective actions he should take to control a skid. Demonstrate the exercise so he will know what to expect. Emphasize that application if the brake or throttle is not used to correct a skid.

1. The driver enters the skid pad on a curved path at a speed of 15 to 25 mph.
2. With the vehicle in the curve, the instructor or the driver will initiate a skid.
3. The driver should immediately back off the throttle and steer in the direction the rear of the bus is moving.
4. As soon as the vehicle responds to the skid correction, the driver must countersteer in the opposite direction until the front wheels are straight and the bus continues in its original path. The driver should be prepared to correct for a ''second'' skid in the opposite direction, if that should happen. A skid may also occur after the service brakes have been released, if they are being used to induce a skid.
5. Upon reaching the end of the skid pad, the driver should turn around and run skids from the opposite direction.

This exercise should be repeated until the driver can handle skid control to the satisfaction of the instructor.

Instructor Tips

Remind the driver that his best defense against skids is to note the road conditions while driving and anticipate the possibility of skidding before it occurs. Make sure he understands why skids occur and emphasize the point that wheels must be rolling at ground speed in order to have cornering capability. This is why it is necessary to ease up on the accelerator and avoid using the brake. Emphasize in your explanation that a second skid is always possible; the driver should be ready for it and make every effort to control it. The following are some common errors made by drivers in the skid exercise:

- Failure to ease up on accelerator.
- Application of brakes which locks wheels.
- Use of the accelerator to control the skid.
- Slow response to the first skid, allowing the vehicle to go beyond point of control.
- Over responds on the first skid and inability to correct in time to prevent the second skid.
- Inability to distinguish which direction the back end is skidding, and, therefore, no correction is made or wheels are turned in the wrong direction.
- Panic response with resulting inability to act.
- Improper hand control, such as palming or throwing the steering wheel.

OFF-ROAD RECOVERY

Objective

The exercise is designed to teach school bus drivers the proper method for getting back on the roadway quickly, when conditions will not allow slowing down and returning at the driver's discretion.

Exercise Layout (Figure 12)

The off-road recovery curb is built into the edge of a hard surface road. It consists of a square edged four-inch curb at least 200 feet long on a straight portion of road. The course should allow 200 feet at both ends of the curb for approach and run out. A line of cones is placed parallel to the curb and 10 feet from it. The cones can be spaced 6 to 10 feet apart. The course can be made more demanding by moving the cone line closer to the curb.

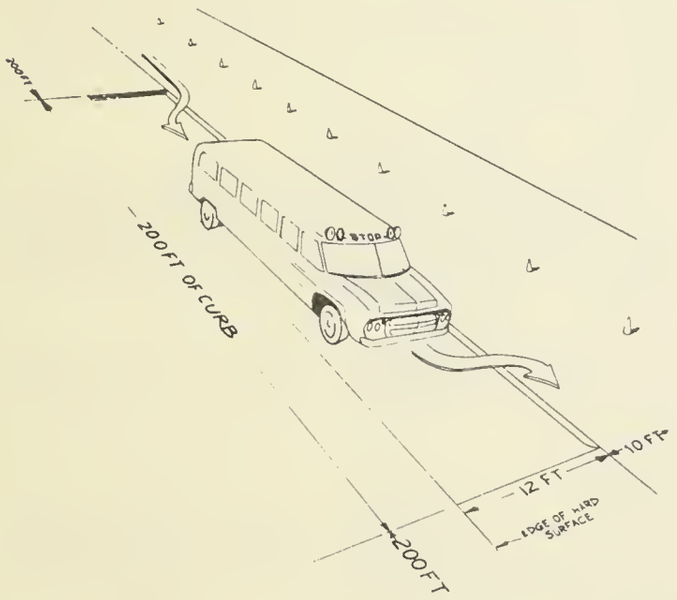


Figure 12—Off-Road Recovery

Procedure

Explain the maneuver and its objective. Demonstrate the exercise to the participating driver so he will know what to expect. At a reduced speed, allow him to scrub the tire against the curb, steering more and more until the tire suddenly climbs onto the road. This dramatically demonstrates the need for proper off-road recovery. The exercise should be run as follows:

1. Accelerate down the cone-marked lane at a speed determined by the instructor.
2. At the beginning of the curb, drop the right wheels off the edge, while maintaining speed, or straddle the curb as it is approached.
3. Position the vehicle over the curb so the wheel has room to turn.
4. Halfway down the curb, turn the steering wheel approximately 90° left, depending on the vehicle and speed.
5. As soon as the right front wheel hits the curb, immediately steer back to the right to maintain lane position.
6. At the end of the course, turn around and run the exercise the other way, dropping the left wheels off the edge. The procedure is the same as described above, except the steering directions are reversed.

The exercise should be repeated until performance is satisfactory.

When the driver becomes proficient in recovering with one side of the bus off the road, he should learn to recover the road with all the wheels off the edge. Give the curb-side tire enough room and turn without scrubbing the wheel to bring the bus back onto the roadway. As the first front wheel comes over the edge, hold the steering wheel steady until the second front wheel hits the curb. Then countersteer as before.

Instructor Tips

Be sure the driver understands that when conditions allow, the recommended practice when going off the road edge is to slow down and recover at his own discretion. As the driver executes the maneuver, watch his steering movements and his timing closely. Common errors made by drivers in the Off-Road Recovery Exercise:

- Steers too little allowing the tire to scrub.
- Failure to position the tire away from the curb, causing it to scrub.
- Countersteers, before the tire contacts the curb.
- Failure to countersteer enough to keep the bus in the curb-side lane.
- Excessive countersteering, causing the bus to go off the road on the same side as before.

STRAIGHT-LINE BRAKING

The straight line braking course is a lane of cones with a barrier of cones blocking one end. On the cue of the instructor, the driver applies the brakes as smoothly as possible, attempting to stop before hitting the barrier.

Objective

The exercise is designed to develop skill in stopping a school bus quickly and smoothly, so as not to injure the passengers. It is important to learn how the bus reacts to application of the brakes.

Exercise Layout (Figure 13)

The course for this exercise is a lane made up of two lines of cones set 12 feet apart. The lane should measure about 250 feet in length. One end is blocked by a barrier of cones. Two cones are set together on the left side of the lane of cones 90 feet from the barrier. The two cones are the cue point for the instructor. An opening is left in the lane at the barrier to allow buses to exit after stopping. The spacing of the cones marking the lane is not critical.

Procedure

Explain the maneuver and its objective. Demonstrate the exercise so participating drivers will know what to expect. Emphasize the importance of "feeling" the reaction of the bus to the brakes. Assume the bus is loaded, thus requiring consideration for passenger safety. The exercise should be conducted as follows:

1. Accelerate to a speed selected by the instructor. Twenty-five mph is a good speed with which to start.
2. When the front bumper reaches the cue cones, the instructor cues the driver to start braking. The cue may be given slightly early or late to account for small variations from the desired speed.
3. Stop the bus as quickly and smoothly as possible.
4. Repeat the course several times, increasing the speed two or three mph following each successful stop. Do this until the driver can brake quickly and smoothly at 35 mph.

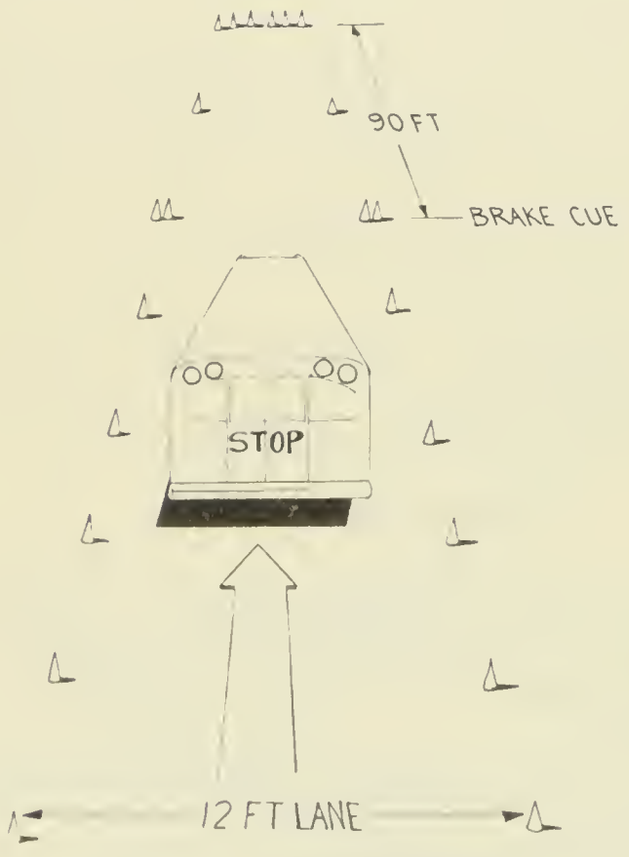


Figure 13—Straight-Line Braking

Instructor Tips

Make sure the driver understands the assumed operating conditions. Note the speed just before he reaches the cue cones, so the cue may be adjusted if necessary. The timing of the cue, especially at the higher speeds, is important to successful performance of the exercise. Remember that a successful stop involves the safety of the passengers, as well as not hitting the barrier. Common errors made in the Straight Line Braking exercise:

- Too slow or too fast entry speed of which the driver is unaware.
- Anticipating the cue by moving foot toward the brake before the cue is given.
- Locking the wheels.
- Failure to brake hard enough, resulting in the bus going through the barrier.
- Braking too late, causing the bus to go through the barrier.
- Pumping the brake.
- Stopping in time but so suddenly that passengers are thrown out of their seats.

VARIABLE CORNERING

A school bus driver cannot travel far without being required to negotiate a variety of corners, curves and turns. Some will be short with sharp degrees of turns and some will be long with gradual constant degrees of turn such as freeway on and off ramps. Drivers must constantly anticipate the severity of these corners and curves so that the forces of nature, i.e., inertia and centrifugal force do not cause a crash due to driver error.

Objective

The objective of the variable cornering exercise is to acquaint the driver with the handling characteristics of the school bus during a long curve with a variable radius and to develop the proper procedures and skills to successfully negotiate this type of curve.

Exercise Layout (Figure 14)

This exercise consists of a 400' curved lane made up of cones set 12' apart. The curve has a variable radius.

Procedure

Explain the exercise and the objective. Demonstrate the exercise so participating drivers will know what to expect. Emphasize the importance of steering and speed control. The exercise should be conducted as follows:

1. Assume the proper driving position.
2. Approach the curve at a speed selected by the instructor.
3. Just prior to entering the curve slow the vehicle to a speed which allows for safe negotiation of the curve.
4. Steer to keep the vehicle in the center of the lane.
5. Maintain steady speed through the curve.
6. Slight acceleration during exit.
7. After exit, turn vehicle around and re-enter going the opposite direction.
8. As the driver's skill level increases so can the speed until he/she reaches the control limit.

Instructor Tips

1. Make sure the driver understands the assumed operating conditions.
2. Driver should decelerate while vehicle is in a straight line position before entering the curve.
3. Watch for smooth braking, proper speed and lane center position.

4. Encourage the driver to begin accelerating once the final apex of the curve is passed. This should level out the vehicle and create a smooth exit.

5. Be alert to the driver's lack of sight. The driver should look beyond the front of the vehicle.

6. Common errors made in the variable cornering exercise:

- enters curve at improper speed
- performs braking too early or too late
- fails to stay in the center of the lane
- accelerates too soon during exit
- brakes when once in the curve
- improper hand position or steering technique
- improper viewing habits—doesn't view the roadway ahead of the vehicle.

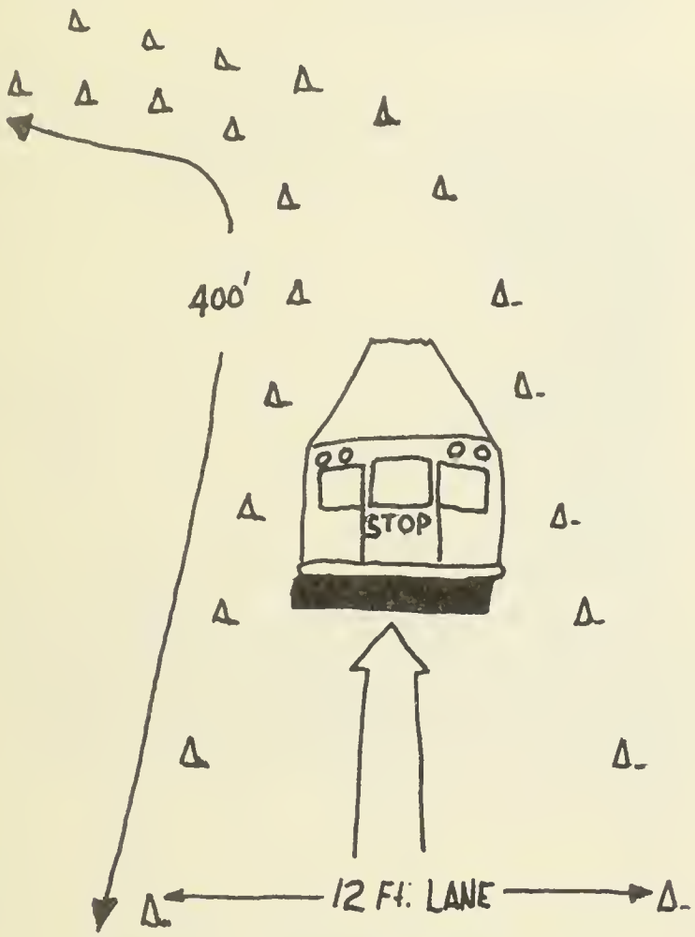


Figure 14—Variable Cornering

OPTIONAL EXERCISES

Wet Straight-Line Braking

This exercise is conducted the same way as the dry straight-line braking, except it is set up on the skid area. The braking distance required on the skid area will be much greater than on the dry surface for any given speed. Therefore, it is necessary to adjust speeds to match the size of the skid area.

Emphasize to the drivers that brakes can be easily locked and a skid may result. If a skid does occur, immediately ease off the brake, allowing the wheels to turn more freely, and be prepared to use corrective steering to maintain the bus in as straight a line as possible.

Braking in Evasive Maneuver

The course layout is the same as for the evasive maneuver. The objective is to bring the bus to a stop as soon as possible after it has passed the barrier. The instructor will cue the driver when to begin his braking and steering maneuver. The driver himself will determine whether to go right or left. Points to remember:

- To maintain steering control, the wheels must not be allowed to lock.
- The rear of the bus must clear the barrier before stopping.
- Attempt to brake without jolting or throwing passengers.

Backing Exercise

Running both the serpentine and evasive courses in reverse gear are good backing exercises. The performance requirements for running the serpentine in reverse are the same as for running it forward. The evasive course can be used two ways. The driver may back down the lane and stop the rear of the bus as close to the barrier as possible. Or, he may back through the entire course, going around the barrier on either side.

These exercises increase skill in relating the bus to fixed objects and in the use of the mirrors.

Facilities and Equipment

COURSE LAYOUT

Each organization will wish to choose or build a site to fit its own needs. A paved area 600 feet by 600 feet is adequate to run all of the exercises described at speeds of 15 to 45 mph. This size area could include a skid pad of 50 feet x 300 feet, an off-road recovery curb 200 feet in length, plus sufficient space to run controlled braking, evasive maneuvers, and serpentine exercises. Three vehicles could be operated simultaneously in this size area with coordination (Figure 15).

You may wish to adapt the emergency driving exercise to an area already constructed. This may be a multi-vehicle driving range, an airport runway or a large parking lot. Regardless of the type of area, the minimum paved space required is 600 feet x 100 feet. The area adjacent to the pavement should be level and free of obstacles in case a vehicle leaves the paved surface. This size area will allow you to teach serpentine maneuvers, controlled braking and evasive maneuvers.

SAFETY ASPECTS

Regardless of the size of the area available, careful consideration must be given to the following safety aspects before the decision to utilize the area can be made.

The area must be flat, free of dips or bumps, and have sufficient grade to allow water to run off the surface. An ideal grade is 1 percent.

The driving and surrounding area must be free of curbing and obstacles.

The driving area should be constructed of high quality paving material, such as asphalt or concrete.

A minimum of 50 feet between exercises should be maintained if more than one vehicle is operating in the area.

Speeds must be adjusted to fit the size of the driving area and the number of vehicles accommodated. Most exercises can be run effectively at 25 mph.

Any time more than one vehicle is in operation, the vehicles should be equipped with radios so they can be coordinated by a central control.

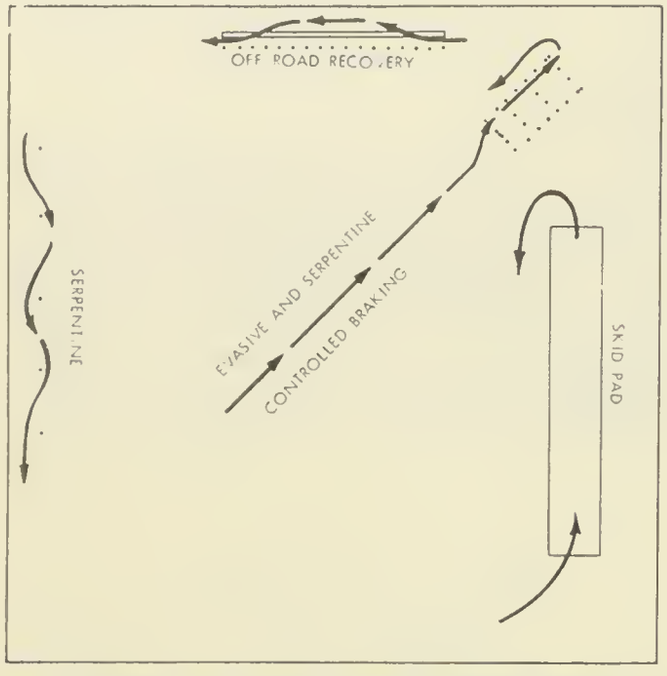


Figure 15— 600' x 600' Driving Area

COURSE SETUP

It is recommended that a scale drawing be made of the area to locate each exercise before starting the actual layout procedure. The exercises can be laid out with paint and traffic cones. The following minimum amount of equipment is recommended:

50 to 150 twelve-inch traffic cones,

100-foot tape measure or measuring wheel,

Spray paint in various colors to code exercises, and

Two-way radio system.

VEHICLE AND PREPARATION

A standard full size school bus is recommended for use in these exercises. The vehicles must be in good condition and should be inspected daily and weekly. It is recommended that an instructor use a checklist during the inspection to make sure nothing is omitted.

Daily inspection prior to driving:

Tires
- Tread depth
- Inflation pressure
- Checks, cracks, and cuts
- Wheel damage

Wheel Lug Nuts
- Proper torque

Engine Compartment
- Oil level
- Coolant level
- Brake fluid level (Hydraulic-Vacuum Boost System)
- Air compressor and belts (Air Brake System)
- Accessory belts
- Power steering fluid level
- Transmission fluid

Driver and Passenger Compartment
- Brake operation
- Steering system

Mirrors
- Driver restraint system: webbing, mounts, latches, retractors
- Secure all loose objects
- All special equipment secure

Weekly inspection and maintenance to be performed by a qualified mechanic as follows:

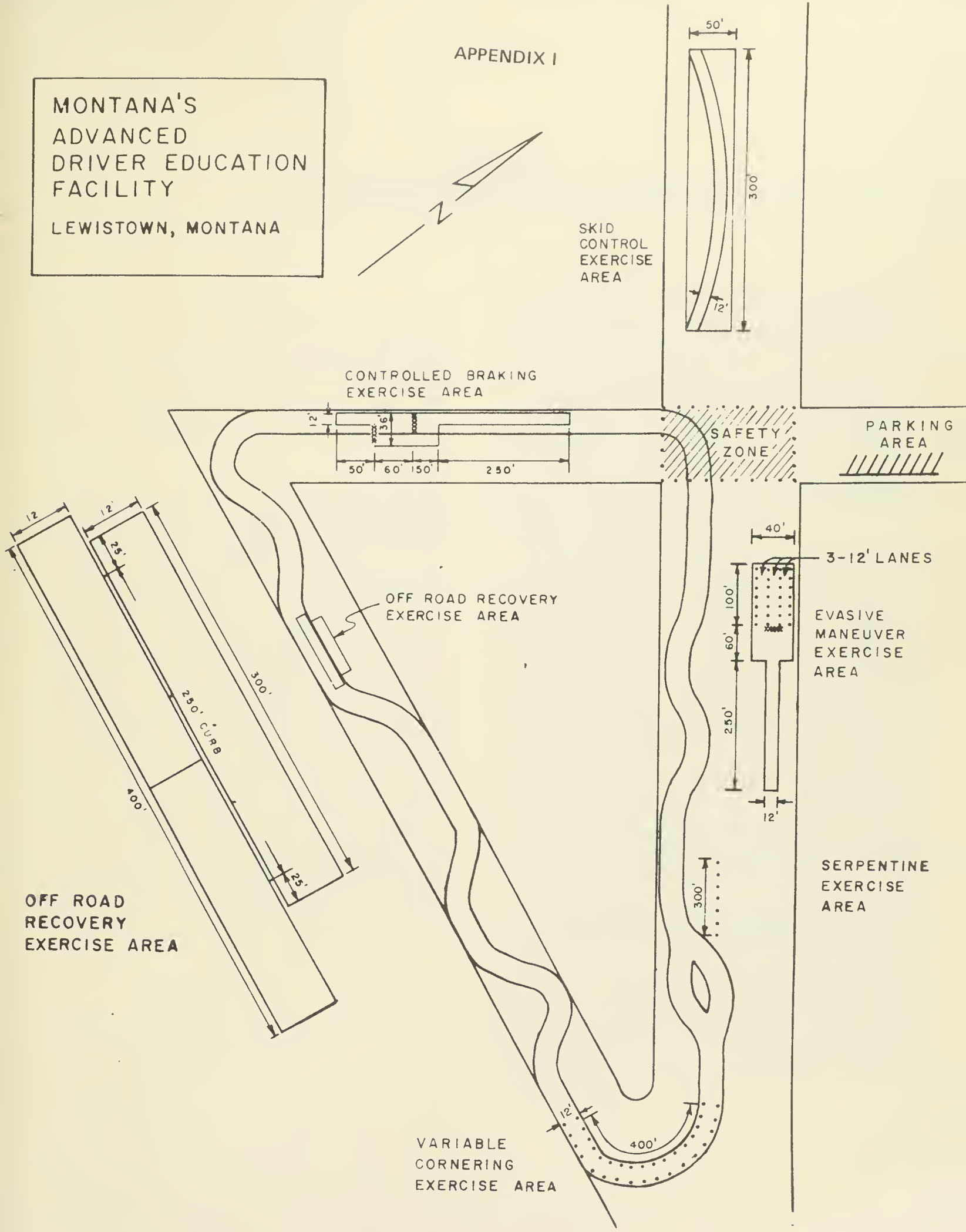
Engine tune-up
Engine mounts
Wheel bearings
Seals
Driveline
Exhaust system
Suspension system
Wheel alignment
Hood latch
Windshield wiper and washers
Lighting system
Air tanks
Battery fluid level

This inspection and maintenance would be in addition to the service schedule prescribed in the owner's manual. Inspection and maintenance is an absolute must in any driving program. Any time the bus does not handle or respond properly, it should be checked by a qualified mechanic. With proper maintenance, emergency training of drivers need not be abusive to a school bus.

APPENDIX I

MONTANA'S ADVANCED DRIVER EDUCATION FACILITY

LEWISTOWN, MONTANA



APPENDIX II
Highway Safety Program Standard Seventeen
Department of Transportation (recommendations)

PURPOSE

Standard 17 is designed to improve state programs for transporting pupils safely in urban and rural areas by setting requirements for proper and safe equipment; maintenance of equipment; selection, training, and supervision of drivers and maintenance personnel; and administrative provisions in the field of pupil transportation.

STANDARD

I. Scope. This standard establishes minimum requirements for a state highway safety program for pupil transportation safety; including the identification, operation, and maintenance of school buses; training of personnel; and administration.

II. Purpose. The purpose of this standard is to reduce, to the greatest extent possible, the danger of death or injury to school children while they are being transported to and from school.

III. Definitions. ''Type I school vehicle'' means any motor vehicle with motive power, except a trailer, used to carry more than 16 pupils to and from school. This definition includes vehicles that are at any time used to carry school children and school personnel exclusively, and does not include vehicles that only carry school children along with other passengers as part of the operations of a common carrier. ''Type II school vehicle'' means any motor vehicle used to carry 16 or less pupils to or from school. This does not include private motor vehicles used to carry members of the owner's household.

IV. Requirements. Each state, in cooperation with its school districts and its political subdivisions, shall have a comprehensive pupil transportation safety program to assure that school vehicles are operated and maintained so as to achieve the highest possible level of safety.

A. Administration. 1. There shall be a single state agency having primary administrative responsibility for pupil transportation, and employing at least one full-time professional to carry out its responsibilities for pupil transportation.

2. The responsible state agency shall develop an operating system for collecting and reporting information needed to improve the safety of school vehicle operations, in accordance with Safety Program Standard No. 10. ''Traffic Records,'' No. 204.4.

B. Identification and equipment of school vehicles. Each state shall establish and maintain compliance with the following requirements for identification and equipment of school vehicles. The use of stop arms is at the option of the state.

1. Type I school vehicles shall:

a. Be identified with the words, ''School Bus,'' printed in letters not less than eight inches high, located between the warning signal lamps as high as possible without impairing visibility of the lettering from both front and rear, and have no other lettering on the front or rear of the vehicle;

b. Be painted National School Bus Glossy Yellow, in accordance with the colormetric specification of Federal Standard No. 595a, Color 13432, except that the hood shall be either that color or lusterless black, matching Federal Standard No. 595a, Color 37038;

c. Have bumpers of glossy black, matching Federal Standard No. 595a, Color 17038; unless, for increased night visibility, they are covered with a retroflective material;

d. Be equipped with a system of signal lamps that conforms to the school bus requirements of Federal Motor Vehicle Safety Standard 108, 49 CFR 571.21; and

e. Have a system of mirrors that will give the seated driver a view of the roadway to each side of the bus, and of the area immediately in front of the front bumper, in accordance with the following procedure:

When a rod 30 inches long is placed upright on the ground at any point along a traverse line one foot forward of the forwardmost point of a school bus, and extending the width of the bus, at least 7½ inches of the length of the rod shall be visible to the driver, either by direct view or by means of an indirect visibility system.

2. Any school vehicle meeting the identification requirements of 1. a-d above that is permanently converted for use wholly for purposes other than transporting pupils to or from school shall be painted a color other than National School Bus Glossy Yellow, and shall have the stop arms, and equipment required by section IV.B.1.d, removed.

3. Type I school vehicles being operated on a public highway and transporting primarily passengers other than school pupils shall have the words, "School Bus," covered, removed, or otherwise concealed, and the stop arms and equipment required by section IV.B.1.d shall not be operable through the usual controls.

4. a. Type II school vehicles shall either:

(1) Comply with all the requirements for Type I school vehicles; or

(2) Be of a color other than National School Bus Glossy Yellow, have none of the equipment specified in IV.B.1.d, and not have the words, "School Bus," in any location on the exterior of the vehicle, or in any interior location visible to a motorist.

b. The state shall establish conditions under which one or the other of the above two specifications for Type II vehicles shall apply.

C. Operation. Each state shall establish and maintain compliance with the following requirements for operating school vehicles:

1. Personnel. a. Each state shall develop a plan for selecting, training, and supervising persons whose primary duties involve transporting school pupils, in order to assure that such persons will attain a high degree of competence in, and knowledge of their duties.

b. Every person who drives a Type I or Type II school vehicle occupied by school pupils shall, as a minimum:

(1) Have a valid state driver's license to operate such a vehicle(s);

(2) Meet all special physical, mental, and moral requirements established by the state agency having primary responsibility for pupil transportation; and

(3) Be qualified as a driver under the Motor Carrier Safety Regulations of the Federal Highway Administration 49 CFR 391, if he or his employer is subject to those regulations.

2. Pupil instruction. At least twice during each school year, each pupil who is transported in a school vehicle shall be instructed in safe riding practices and participate in emergency evacuation drills.

3. Vehicle operation. a. Each state shall develop plans for minimizing highway use hazards to school vehicle occupants, other highway users, pedestrians, and property, including but not limited to:

(1) Careful planning and annual review of routes for safety hazards;

(2) Planning routes to assure maximum use of buses, and avoid standees;

(3) Providing loading and unloading zones off the main traveled part of highways, wherever it is practicable to do so;

(4) Establishing restricted loading and unloading areas for school buses at or near schools;

(5) Requiring the driver of a vehicle meeting or overtaking a school bus that is stopped on a highway to take on or discharge pupils, and on which the red warning signals specified in IV.B.1.d are in operation, to stop his vehicle before it reaches the school bus and not proceed until the warning signals are deactivated; and

(6) Prohibiting, by legislation or regulation, operation of any vehicle displaying the words, "School Bus," unless it meets the equipment and identification requirements of this standard.

b. Use of flashing warning signal lamps while loading or unloading pupils shall be at the option of the state. Use of red warning signal lamps for any other purpose, and at any time other than when the school vehicle is stopped to load or discharge passengers, shall be prohibited.

c. When vehicles are equipped with stop arms, such devices shall be operated only in conjunction with red signal lamps.

d. Seating. (1) Seating shall be provided that will permit each occupant to sit in a seat in a plain view lateral location, intended by the manufacturers to provide seating accommodation for a person at least as large as a fifth percentile adult female, as defined in 49 CFR 571.3.

(2) Bus routing and seating plans shall be coordinated so as to eliminate standees when a school vehicle is in motion.

(3) There shall be no auxiliary seating accommodations such as temporary or folding jump seats in school vehicles.

(4) Drivers of school vehicles equipped with lap belts shall be required to wear them whenever the vehicle is in motion.

(5) Passengers in Type II school vehicles equipped with lap belts shall be required to wear them whenever the vehicle is in motion.

D. Vehicle maintenance. Each state shall establish and maintain compliance with the following requirements for vehicle maintenance:

1. School vehicles shall be maintained in safe operating conditions through a systematic preventive maintenance program.

2. All school vehicles shall be inspected at least semi-annually, in accordance with Highway Safety Program Manual Vol. 1, published by the Department of Transportation, January 1969. School vehicles subject to the Motor Carrier Safety Regulations of the Federal Highway Administration shall be inspected and maintained in accordance with those regulations (49 CFR Parts 393 and 396).

3. School vehicle drivers shall be required to perform daily pre-trip inspections of their vehicles, and to report promptly and in writing any defects or deficiencies discovered that may affect the safety of the vehicle's operation or result in its mechanical breakdown. Pre-trip inspection and condition reports for school vehicles subject to the Motor Carrier Safety Regulations of the Federal Highway Administration shall be performed in accordance with those regulations (49 CFR 392.7, 392.8 and 396.7).

V. Program evaluation. The pupil transportation safety program shall be evaluated at least annually by the state agency having primary administrative responsibility for pupil transportation. The National Highway Traffic Safety Administration shall be furnished a summary of each evaluation.

SUMMARY OF COMMENTS AND RECOMMENDATIONS MADE BY THE NATIONAL HIGHWAY SAFETY ADVISORY COMMITTEE ON THE PUPIL TRANSPORTATION SAFETY STANDARD

As required by statute, the National Highway Safety Advisory Committee reviewed the draft Pupil Transportation Safety Standard and made comments and recommendations to the Secretary of Transportation in May and November 1970, summarized as follows:

1. The Committee recommended that the standard be issued initially to cover "pupil transportation safety" but that the standard should be expanded in the future to cover all youth transportation not under the jurisdiction of the Department of Transportation's Bureau of Motor Carrier Safety.

2. The Committee favored a "no standee" provision.

3. The Committee supported the uniform warning system for school buses but recommended that warning systems (flashing lights) to control traffic should not be limited to larger buses (Type I vehicles).

4. To allow the use of highly reflective colors to ward off excessive solar radiation, the Committee recommended that school bus roofs be permitted to be some color other than school bus yellow. The Committee also recommended the deletion of the provision requiring bumpers to be painted "glossy black" to allow the use of rubber or other innovative bumper devices not susceptible to being painted.

5. Because of the inadequate and incompatible seat and body structure designs of school buses, the Committee approved the omission of seat belts for passengers. The Committee also recommended that passengers in Type II vehicles be required to use belts only if so equipped.

6. The Committee recommended that monitors or proctors be required on each school bus to aid in loading and unloading the bus and to free the driver from tending the passengers while driving.

7. The Committee favored a provision in the standard calling for the periodic reevaluation or requalification of school bus drivers.

8. To allow states more flexibility in vehicle inspection programs, the Committee recommended that school buses be inspected "periodically" rather than "semiannually."

APPENDIX III

AVERAGE TIME SPENT IN INTERSECTIONS FOR SCHOOL BUSES

AVERAGE TIME SPENT IN INTERSECTIONS FOR SCHOOL BUSES

			Data (seconds)				
			Base			Field	
Direction	Control	No. of Lanes	AL	ME	ML	L	E
Right	Stop (20')	any - any	5.93	5.5	6.27	6.12	5.9
Right	Stop (close)	any - any	5.47	4.7	6.67		
Right	No Stop	any - any	4.77	3.4	4.5	5.24	4.95
Left	Stop (20')	2 lane - 2 lane	5.97	5.4	5.77	8.02	6.43
Left	Stop (close)	2 lane - 2 lane	5.13	5.0	5.57		
Left	No Stop	2 lane - 2 lane	4.77	3.93	4.07	5.55	5.4
Left	Stop (20')	(2-4) lane - (2-4) lane	6.5	6.07	6.8	10.74	8.15
Left	Stop (close)	(2-4) lane - (2-4) lane	5.7	5.37	6.7		
Left	No Stop	(2-4) lane - (2-4) lane	4.97	3.83	4.4	5.63	6.5
Straight	Stop (20')	2 lane	5.07	4.5	5.17	4.7	5.2
Straight	Stop (close)	2 lane	4.7	4.03	4.37		
Straight	Stop (20')	3 lane	5.57	5.0	5.67	7.36	7.15
Straight	Stop (close)	3 lane	5.0	4.53	4.93		
Straight	Stop (close)	4 lane	6.0	5.67	6.3	8.7	7.93
Straight	Stop (close)	4 lane	5.47	5.0	5.5		

AL – Automatic Loaded
ME – Manual Empty
ML – Manual Loaded

L – Loaded
E – Empty

APPENDIX IV

DAILY INSPECTION SHEET

Tires

- Tire Tread Depth _____ ☐
- Inflation Pressure _____ ☐
- Checks, Cracks, Cuts _____ ☐

Wheels

- Rim Damage _____ ☐
- Lug Nuts _____ ☐

Engine Compartment

- Oil Level _____ ☐
- Coolant Level _____ ☐
- Brake Fluid Level _____ ☐
- Battery Water Level _____ ☐
- Accessory Belts _____ ☐
- Power Steering Fluid Level _____ ☐

Driver and Passenger Compartment

- Brake Operation _____ ☐
- Steering System _____ ☐
- Restraint System _____ ☐
- Two-way Radio System _____ ☐
- Secure or Remove Loose Objects _____ ☐

Trunk Compartment

- Spare Tire and Jack Secured _____ ☐
- Special Equipment Secured on Skid Vehicle _____ ☐
- Secure or Remove Loose Objects _____ ☐

Check Fuel Level _____ ☐

Date Inspected: _____
Time Inspected: _____
Inspected by: _____

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